

Deep phylogeny of the amphipod super-family Eusiroidea

Verheye M. and C. d'Udekem d'Acoz

Department of Recent Invertebrates, Royal Belgian Institute of Natural Sciences,
B-1000 Brussels, Belgium
E-mail: mverheye@naturalsciences.be

The super-family Eusiroidea is traditionally divided into 4 families, namely Calliopiidae, Eusiridae, Gammarellidae and Pontogeneiidae (De Broyer *et al.*, 2007), but recent phylogenetic data suggests that the eusiroid clade forms a much broader assemblage (Englisch, 2001). Representatives are found in all oceans, inhabiting every trophic niches and a wide bathymetric range. With 216 described species in the Southern Ocean (i.e. about 24% of its known amphipod fauna), eusiroids constitute a significant fraction of the Antarctic and sub-Antarctic biodiversity (De Broyer *et al.*, 2007).

The eusirid concept is very inadequately defined morphologically. The super-family forms a diverse assemblage of taxa of gammaroid form, globally characterized by the loss or reduction of the accessory flagellum (Bousfield & Hendrycks 1995). The family assignment of genera is often challenging, since there is no consistent set of diagnostic characters defining most of them. The 6 families formerly comprised in the non-validated taxon Iphimedioidea (Lowry & Myers 2000), as well as the Astyridae and Stilipedidae were recently considered as eusiroids. Moreover, previous 18S phylogenetic reconstructions revealed that the Astyridae, Iphimediidae, Epimeriidae and Pleustidae are nested within the eusiroid clade (Englisch 2001).

With the aim of clarifying those major nomenclatural uncertainties and discussing the phylogenetic relationships, a deep phylogeny of the super-family Eusiroidea, including representatives of all the aforementioned families, was reconstructed using two different gene fragments (28S rRNA and 18S rRNA). The analysis was performed at a global scale, mostly with Antarctic taxa, but also European and Arctic species.

The study confirms that the Eusiroidea forms a much broader clade than claimed in classical literature. It revealed that most of the traditionally delimited families are not monophyletic and that a few taxa previously considered as eusiroids (*Gammarellus*, *Cleippides*) are in fact very distantly related, and therefore should be excluded from them. Eusiroids comprise several independent armoured and spiny lineages nested amongst taxa with plesiomorphic morphologies, suggesting convergent evolutions and rapid morphological specializations under intensive selection pressures. The limits of the super-family and its composing clades have to be completely re-established in the light of this new genetic dataset. This study enables a clearer understanding of the taxonomy of one of the major amphipod assemblage in the Southern Ocean and gives us insights into the patterns of its phenotypic evolution. It proposes a solid frame for further analysis of the systematics of various Antarctic eusiroid lineages, especially the epimeriid and iphimeriid clades, which will be studied in more depth.

References

- Bousfield E.L. and E.A. Hendrycks. 1995. The amphipod superfamily Eusiroidea in the North American Pacific region. I. Family Eusiridae: systematic and distributional ecology. *Amphipacifica* 1(4):3-59.
- De Broyer C., J.K. Lowry, K. Jażdżewski and H. Robert. 2007. Volume 1: Part 1. Catalogue of the Gammaridean and Corophiidean Amphipoda (Crustacea) of the Southern Ocean with distribution and ecological data. *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique* 77(1): 47-64.
- Englisch U. 2001. Analyse der Phylogenie der Amphipoda (Crustacea, Malacostraca) mit Hilfe von Sequenzen des Gens der RNA der kleinen ribosomalen Untereinheit. Phd thesis. Ruhr-Universität Bochum, Germany.
- Lowry J.K. and A.A. Myers. 2000. A family level phylogeny of iphimeriid amphipods (Crustacea, Amphipoda). [Abstract] Xth International Colloquium on Amphipoda, Heraklion, 16-21 April 2000: 30.